

CHAPTER

1

INTRODUCTION

Branches of Civil Engineering, Scope of Civil Engineering, Role of Civil Engineer in Society, Impact of infrastructural development on economy of country.

1.1 INTRODUCTION :

“Engineering is the art based primarily upon training in mathematics and the physical sciences of utilizing economically the forces and material of nature for the benefit of man.” – Robert E. Doherty

Engineering means application of science for the fulfillment of needs and betterment of people by use of materials, other resources and controlling power by means of engines and machines. Engineering is concerned mainly with the designing ,fabricating, erecting, manufacturing, installing, operating, controlling and maintaining engines, machines, instruments and equipments, as well as constructing structures. That branch of engineering which is concerned with the structures is known as **civil engineering**. Engineering is a very wide field and main disciplines of engineering are Civil Engineering, Mechanical Engineering, Electrical Engineering, Electronics Engineering, Instrumentation and Control Engineering, Computer Engineering, Information Technology, Chemical Engineering, Environmental Engineering, Metallurgy, Textile Engineering, Marine Engineering, and Mining Engineering.

“Civil engineering is the art of directing the great sources of power in nature for the use and convenience of man.” – Definition adopted in Royal charter of Institution of Civil Engineers London.

“Civil engineering is that field of engineering concerned with planning, design and construction for environmental control, development of natural resources,

buildings, transportation facilities and other structures required for health, welfare, safety, employment and pleasure of mankind". – Definition given by Fredrick S. Merrit in his standard hand book for civil engineers.

Civil engineering can also be described as "Engineering concerned with designing, constructing and maintaining works of public utility". Civil engineering is that branch of engineering profession which deals with planning, designing and construction of structures. Here the term structure is used in very broad sense which includes various types of structures, according to their material, it may be a steel, wooden, concrete, masonry and earth structure and as per their use or function they are buildings, roads, bridges, railways, tunnels, canals, dams, ports, harbours, airports and such many others. Civil engineering is concerned with the works of public utility like works for transportation, irrigation and public health. According to the type of the structure, and activities carried out, main branches of civil engineering are classified as Surveying, Building Planning and Construction, Advanced Construction, Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Transportation Engineering, Environmental Engineering and Town Planning. The above mentioned branches can also be called as divisions, fields and areas of civil engineering.

Modern development in engineering begins as military engineering during 18th century. Civil engineering has emerged as separate engineering discipline from military engineering during the 18th century, chiefly in the construction of roads, bridges and canals. John Smeaton was the first person to use "civil engineer" term to differentiate the civilian engineer from the military engineer. In 1747 Jean Petronet, established "*Ecole Des Ponts Et Chaussees*" in Paris one of the earliest engineering school imparting training in bridges and road building for the military corps. In 1794 the "*Ecole Polytechnic*" was established in Paris in France. In 1824 Rensselaer Polytechnic was established in New York in United States. In India education in civil engineering was pioneered by the Roorkee college, established in 1847 as first engineering college of India, that was renamed as Thomson College of Civil Engineering in 1854. It became first Engineering University of India in 1949 and has now become Indian Institute of Technology Roorkee. In United Kingdom Institute of Civil Engineers was established in 1818, in United States of America, American Society of Civil Engineers was established in 1852 and in India Institution of Engineers was established in 1920.

The main scope of civil engineering or the task of civil engineering is planning, designing, estimating, supervising construction, managing construction execution and maintenance of structures like buildings, roads, bridges, dams etc. The main concern of civil engineer is to deal with the structures which

may be a building, work of public utility or specific needs of any other engineering project. A major engineering project needs supports from all engineering groups mainly civil, electrical, mechanical, instrumentation and control, electronics and others. By providing structural base, civil engineers are pioneering the commencement of the project. Civil engineering is also concerned with infrastructural projects like transportation, power, and water resources engineering. Civil engineering acts as a coordinating agency among various engineering groups working for a multidisciplinary engineering projects.

One who designs and maintains works of public utility is known as **civil engineer**. Civil engineer should have qualities like scientific attitude of mind, imaginative and intuitive approach. He should have good analysis and decision power procured by study and training. He should be able to solve engineering problems by mathematical modeling, scientific principles and laboratory techniques using computers and information technology. He should be able to use operation research techniques for solution of management problems. He should be able to carry out proper planning and scheduling for execution of the project.

1.2 BRANCHES OF CIVIL ENGINEERING :

Civil engineering is a wide field and includes many types of structures such as residential buildings, public buildings, industrial buildings, roads, bridges, tunnels, railways, dams, canal and canal structures, airports, harbours and ports, water treatment plant, waste water treatment plant, water supply network and drainage network. According to the types of structures and activities carried out, main branches of civil engineering are classified as follows.

- (1) Surveying and Levelling
- (2) Building, Planning and Construction
- (3) Advanced Construction
- (4) Structural Engineering
- (5) Geotechnical Engineering
- (6) Water Resources Engineering
- (7) Transportation Engineering
- (8) Environmental Engineering
- (9) Town Planning

(1) Surveying and Levelling :

Surveying includes measurements of distances and angles in horizontal and vertical planes, while levelling is the measurement of heights in vertical plane. Chain, tape, compass, level and theodolite are the instruments used for surveying. Surveying fixes the relative positions of different points on the

surface of earth. It also includes measurements of areas and volumes. Basic aim of surveying is to prepare a map of the area to some scale. Surveying is carried out to fix the alignment of road, railway and canal. It is also useful in selecting the site for the construction of structure. Electronics total station and Global Positioning System (GPS) are the modern electronic digital instruments for the survey work. Remote Sensing and Geographical Information System (GIS) are adopted for surveying and planning of many civil engineering projects.

(2) Building Planning and Construction :

Civil engineers are concerned with many types of structures of which buildings are of prime importance. Buildings are planned according to the fundamental principles of planning and bye-laws of local municipal bodies. Building planning requires basic knowledge of principles of Architecture. Main components of buildings are foundation, masonry, doors, windows, stairs, floors, roofs and many other. Material like brick, stone, lime, cement, sand, aggregate, mortar, concrete, steel, wood, tiles, glass, plastic etc. are used for the construction. Buildings may be residential building or public building like school, college, government office, hospital, post office, hostel, etc.. Industrial buildings are workshops, warehouses and industrial sheds. They are designed according to need of specific industrial process and purposes. Planning and design of building should be earthquake resistant.

(3) Advanced Construction :

Construction of dams, bridges, tunnels, ports, etc. requires several advanced techniques of construction. Under water construction requires special type of equipments. Pile foundations or well foundations are generally provided for foundation of bridges across rivers in alluvial soils. Large scale earthwork in excavation requires equipments like power shovel, dragline, bulldozers, etc. For massive concrete work in dam concrete mixing plant is required to be erected at the dam site. These types of construction techniques come under category of advanced construction. Construction of power station, off shore oil rig, port, tunnel, etc. is also known as heavy construction.

(4) Structural Engineering :

This branch of civil engineering deals with the structural analysis and design of structures. Structural analysis is done to calculate stresses in the structural components, on the bases of loads acting on structures. According to the strength of materials used for structures, sections of structural elements like beams, columns, slabs, etc. are designed. Structural analysis requires much calculation, hence advanced computing software are used to carry out structural analysis and design. It includes design of reinforced cement concrete (RCC) and steel structures as concrete and steel are most widely used material. Design of

multistoried buildings, towers, retaining walls, water tanks, bridges requires skill and knowledge of structural engineering. Structure design should be safe, durable and economic. Design of structure should be earthquake resistant.

(5) Geotechnical Engineering :

Geotechnical engineering is that field of civil engineering which deals with soil investigation and design of proper foundations of structures. Simple footing, raft foundation, steel grillage foundation are generally provided for the foundation of buildings, while pile foundation, well foundations etc are provided for bridges in alluvial soil. Foundations may be subjected to static load or vibration and impact. Soil investigation includes collection and testing of soil samples. Geotechnical engineering includes measurement of soil parameters and safe bearing capacity. It also includes construction and design of simple foundations, pile foundations, well foundations, caissons, coffer dams, construction of foundation of dams, construction of tunnels, subbase of road, earthen dams, earth related marine construction. Sound knowledge of geology and geotechnical engineering is necessary for construction of earth related structures.

(6) Water Resources Engineering :

Water resources engineering means measurements, utilization, and development of water resources for agriculture, municipal and power generation purpose. It mainly includes irrigation engineering, design of hydraulic structures like dams, canals, etc. and water power engineering. Water resources engineering deals with planning, designing and developing water resources by constructing several hydraulic structures like dams, barrages, hydropower stations, canal and pipe networks etc. It also includes watershed planning, water harvesting techniques, soil conservation and soil reclamation. Hydrology is also a part of water resources engineering. Hydrology includes study of sources of water, measurement of rainfall, study of rainfall, runoff, flood and flood control.

(7) Transportation Engineering :

Transportation means movement of passengers and goods by means of vehicles on land, ships on water and aircrafts in air. Transportation is that branch of civil engineering which deals with planning, designing and construction of roads, bridges, railways, tunnels, harbours, ports, docks, runways and airports. For development of any nation good transportation network is a prime requirement. Large scale transportation of goods is done by railways. Bridges are constructed to cross the rivers. Tunnels are constructed in hilly areas to avoid excessive cutting of earth. For development of any area, good network of road will be helpful to bring agricultural products of rural areas to the urban commercial centers. It also includes study of materials for construction of roads like road metal, bitumen, asphalt, tar and concrete. It also includes traffic engineering.

(8) Environmental Engineering :

Environmental engineering deals with pollution control and public health engineering. Different types of pollutions are water, air, noise and other pollutions. Public health engineering includes water treatment, waste water treatment, water distribution system, drainage network and solid waste management. Due to large scale industrialization, population growth, rapid urbanization and several other human activities like construction, mining, transportation, environment get polluted and ecosystem get disturbed which results in occurrence of major environmental problems. Major environmental problems which mankind is facing now are pollution of environment, global warming, acid rain, depletion of ozone layer and depletion in natural resources. Environment engineering includes design, construction and maintenance of water treatment plant, waste water treatment plant, water distribution network and sewerage system. It also includes solid waste management in towns and cities.

(9) Town Planning :

Town planning means planned and controlled growth of town by dividing land of the town into the different land use zones and regulating building construction to provide better environment for the people of the town. In town planning areas of town are divided into residential, commercial, recreational and industrial zones, which is known as zoning. Services like road network, water supply and drainage network are planned. Floor space index and other byelaws are fixed to guide and regulate the building construction. Gardens, green belts etc. are planned for creating better environment and aesthetics. For towns and cities master plan for town planning schemes are prepared to accommodate future growth of town in better way. Planning of a very large area covering several towns and villages is known as regional planning.

1.3 SCOPE OF CIVIL ENGINEERING :

The main scope of civil engineering or the task of civil engineering is planning, designing, estimating, supervising construction, managing construction, execution and maintenance of structures. (GTU Winter 2013)

The scope of civil engineering is two fold : (i) according to the field of work, area of services and type of the structure and (ii) Functions of civil engineering. They are discussed below.

(I) Scope of Civil Engineering According to the Field of Work, Area of services and Type of the structure :

They are

- (i) Building Construction
- (ii) Construction of Heavy Structures
- (iii) Geotechnical Engineering
- (iv) Transportation Engineering
- (v) Water Resources Engineering
- (vi) Environmental Engineering
- (vii) Town Planning

The scope of civil engineering is discussed according to the field of work as below.

(i) Building Construction :

Constructing residential buildings like apartments, tenements, flats, raw houses, bungalows, villas, quarters etc. Constructing Public buildings like schools, colleges, government offices, post offices, hospitals, shopping complexes, hostels, etc. Constructing industrial buildings like workshops, ware houses, stores and industrial sheds. It also includes study of building materials and constructing methods and techniques of building components like foundation, masonry, doors and windows etc..

(ii) Construction of Heavy Structures :

Constructing bridges, dams, ports, airports, under water construction, tunnels, cofferdams, caissons, pile foundations, well foundations etc. with advanced construction techniques. It also includes study of several advanced techniques, modern equipments and materials.

(iii) Geotechnical Engineering :

Constructing several types of foundations like simple footing, well foundation, pile foundation ,coffer dams and foundations of machines subjected to vibrations is the main scope of geotechnical engineering. It further includes constructing tunnels, earthen dams, earth work for highways and railways. It also includes soil investigation and soil testing.

(iv) Transportation Engineering :

Constructing structures related to the transportation engineering like, roads railways, bridges, tunnels, ports, harbours, runways and airports. It also includes traffic engineering and study of highway materials.

out to know the economic viability and to select one alternative among several other options.

(b) Construction Execution and Supervision :

To Carry out the actual execution of the construction of the structure and to supervise the progress of the work as per the plan, design and specification and condition of the contract. During the actual construction engineer has to provide technical guidance to the contractor and monitor the progress. Management practices during construction also includes handling of the equipments and material store. It also includes observing labour laws and safety precautions.

(vi) Quality Control and Research :

To have a quality check by testing of material and checking workmanship. During the actual construction, quality of the material can be checked by testing the various properties of the materials. Materials should comply the needs of specifications. Workmanship like dimensions, lines and levels, finishing etc is also required to be checked. To carry out research for improvement in the quality, strength, durability and look of the structure through innovative practices.

(vii) Maintenance of Structure :

To carry out the maintenance of the structure after the construction is over. Structure needs maintenance and proper care. Due to continuous utilization of structure, wear and tear occur hence maintenance of the structure is required. Repair works are required to protect the structures to make them free from the effects of damage or deterioration. Some maintenance works are carried out annually like white washing and painting. Different types of the repair works are current repairs, special repairs and major repairs according to the type of the repairs.

1.4 ROLE OF CIVIL ENGINEER IN SOCIETY :

(GTU June 2010, Dec. 2010, June 2011, Winter 2013, Summer 2015)

Civil engineer is the one who designs or maintains works of public utilities (structures like buildings, roads, bridges, railways, canals etc).

Following are the main roles or duties of civil engineers.

- (1) The main role of Civil Engineer is in surveying, planning, designing, estimation and execution of structures like buildings, roads, bridges, railways, ports, airports, dams, canals, water and waste water treatment plants, water distribution network and sewerage system.
- (2) To use scientific and engineering principles for artistic, optimum, economical and technical solutions of different engineering problems.

- (3) To solve different engineering problems with the help of field experience, laboratory techniques, numerical methods, mathematical models, using computer and information technology.
- (4) To implement management techniques for better management of man, material, machine and money. To carry out planning of the execution of work by various scheduling techniques like bar chart and critical path method (CPM). To solve management problems using operation research techniques.
- (5) To carry out surveying and levelling with survey instruments for setting out of works and preparing map or contour map etc. of site. To fix boundaries of plots and to calculate area and volume. To fix the alignments (centre-line) of roads, railways, canals, tunnels, pipes etc.
- (6) To carry out soil investigations for the design of foundations of structures.
- (7) To carry out planning of building as per its functional needs, as suggested by client or user, the building may be residential building, public building or industrial building, etc. He has to plan buildings according to the byelaws of local authorities and get construction approval from them like municipalities. Civil engineer has also a role in town and regional planning.
- (8) To carry out the design of structures as per the principles of structural analysis and design. He should also ensure that design is safe, durable and economic.
- (9) To carry out quantity survey and to prepare estimate to know probable cost of completion of work.
- (10) To invite tenders and to select contractor for the work.
- (11) To supervise the work during execution and to ensure progress of work. At the end of work he has to give completion certificate and to handover the work to the user or owner.
- (12) To carry out valuation of land or building for the purpose of finding its sale or purchase price or taxation.
- (13) Civil engineers are mainly concerned with structures of public utility like transportation, irrigation and public health engineering As a part of employee of municipality or local bodies he has to maintain public health by providing pure water for drinking, treating waste water before disposing in to water course and to collect the solid waste of town and disposing it. Thus he helps in protecting the environment.

(14) Major civil engineering projects are taken by government for public welfare, like transportation project , water resources project etc. Civil engineer has to work for general welfare of people.

(15) Civil engineer has to provide basic infrastructure of the structures for projects of many other engineering disciplines, like to design machine foundations and to provide steel frame structure and sheds for industries for the mechanical engineering project. To construct tunnels for hydropower stations, to construct cooling tower for thermal power stations and to erect transmission tower for electrical lines for electrical engineering. To erect steel towers for the communication for electronics and telecommunication engineering projects.

Hence civil engineers can play important role in infrastructural developments.

1.5 IMPACT OF INFRASTRUCTURAL DEVELOPMENT ON THE ECONOMY OF A COUNTRY :

1.5.1 Construction Sector in India :

Indian construction industry employs more than 3.3 crore people. Contribution of construction industry is about 6.5 percent of Gross Domestic Product (GDP). More than half of the expenditure budget is spent on construction industry. Central and State governments expenditure was about Rs. 1,40,000 crore in 1999–2000 and likely to cross Rs. 8,00,000 crore by 2011–12. Total amount of expenditure on construction including government and private was about Rs. 2,63,000 crore in 2000, Rs. 3,00,000 crore in 2001 and Rs. 3,40,000 crore in 2002. There are more than 200 firms in the corporate sector and more than 1,20,000 class-A contractors in India. Around 15% of nations working population is depending for its employment on construction.

1.5.2 Infrastructure :

(GTU, Summer 2014)

The infrastructural sector covers a wide range of services such as (i) transportation, which includes roads, railways, ports, airports, shipping, and distribution (iv) telecommunication (v) postal facilities (vi) banking and (vii) science and technology.

1.5.3 Infrastructural Details of India and Gujarat :

Some basic details regarding infrastructure of India and Gujarat is given below.

(a) India :

In the infrastructure sector India has progressed very well. India has geographical area of 32,87,590 sq.km. and population of 102,87,37,436 (2001) and coast

line of 6100 km of mainland. India has 65569 Km length of national highways, 1,30,000 km of state highways and total length of all the roads 3.34 million km. Roadways carry 70 % of freight traffic and 85% of passenger traffic. Traffic on road is growing at 7 to 10% per annum while vehicle population is growing at 12 % per annum. India has total 63221 km route length of railways and total railway track of 1,08,486 Km. Railways carry 15 % of passenger traffic and 30 % freight traffic. In country there are 12 major ports at Bombay, Kandla, Nhava Sheva off Bombay, Marmagao, New Mangalore, Kochi, Tuticorin, Chennai, Vishakhapatnam, Paradip, Ennore and Haldia. In country there are 187 minor ports. Approximately 95% of country's trade volume (70% in terms of value) is transported by the sea. India has total 449 air strips. Airport authority manages 125 airports, There are 11 International airports in the country among which main are at Delhi, Mumbai, Kolkatta, and Chennai. There are 77 civil domestic airports in the country. In telecommunication, India has 37565 telephone exchanges and 99.17 million telephone connections and 42.12 million cellular subscribers in 2005. Cellphone connections increases up to 296.08 million as on june 2008 . In electrical power sector India has total installed capacity of 1,27,056 MW (sept 2006). Total generation of electricity was 594.456 billion units in 2004–2005. In water resources sector India has created irrigation potential in 93.95 million hectares up to 2002.

(b) Gujarat :

Well developed infrastructure of the Gujarat state helps industrial growth very well in the state. Gujarat has geographical area of 1,96,024 sq.km. and population of 5,06,71,017 (2001) and coastline of 1600 Km. Gujarat has 2362 Km of national highway, 19180 Km of state highway and total length of roads is 74031 Km. India's first express way no. 1, Ahmedabad–Baroda expressway is 95 Km in length. Gujarat has 5310 Km of railway length. Gujarat has 8651 MW (2001–2002) installed capacity for electrical power and generation of power is 50069 Mwh. Gujarat has 1 major port at Kandla and 40 minor ports, other important ports are Navlakhi, Porbandar, Pipavav, and Mundra. Gujarat has total 11 airports among which 1 International airport at Ahmedabad and other important domestic airports are at Baroda, Surat and Rajkot. In irrigation sector Gujarat has 3.429 million hectares of land under irrigation and by completion of the Sardar Sarovar (Narmada) Project another 1.79 million hectare of land will be brought under irrigation.

1.5.4 Impact of Infrastructure Development on the Economic Development of a Country :

(GTU Dec. 2008, April 2010, Dec. 2011, Winter 2014)

Infrastructure is the backbone of nation's progress. It is a main engine of economic progress. For economic and industrial development of a nation, infrastructural development is a basic and prime need. During 11th five year plan (2007-2012) estimated investment requirement on infrastructure is near to Rs. 14,50,000 crore.

Well developed infrastructural facilities are the key to development of any nation. Most of the infrastructural projects are relating to construction of transportation systems and heavy construction.

The infrastructural facilities mainly transport, power, communication, water resources, banking, science and technology create environment in which industries and business can grow. Due to the basic facilities which any industry needs are provided by infrastructure hence industrial growth is accelerated. In India due to recent development in infrastructural sector, country has progressed well. Per capita income and Gross domestic product are the economic measures for assessment of development.

Per Capita Income :

Per capita income is the average income of normal resident of a country in a particular year. It is obtained by dividing national income of a country by its population.

Gross Domestic Product (GDP) :

Gross domestic product at market prices is the value of all fixed goods and services at prices prevailing in the market produced in the domestic territory of a country during a given year.

The following Table 1.1 gives details of per capita income and GDP.

Table 1.1 Details of per capita income and GDP

Year	2006–07	2007–08	2008–09
Per capita income Rs.	22580	24295 (7.6%)	25494 (4.9%)
GDP Rs. crore (At Factor cost)	2871120	3129717 (9.0%)	3339375 (6.7%)

Due to the acceleration of progress of infrastructural projects overall development and upliftment of common people can be done. Thus, the infrastructure development is key to economic development of any country. Under the umbrella of well developed infrastructural network industrial growth will be flourished and nourished.

*** REMEMBER KEY POINTS ***

1. Engineering is the art based primarily upon training in mathematics and the physical sciences of utilizing economically the forces and material of nature for the benefit of man.
2. Civil engineering is the art of directing the great sources of power in nature for the use and convenience of man.
3. Civil engineering is that field of engineering concerned with planning, design and construction for environmental control, development of natural resources, buildings, transportation facilities and other structures required for health, welfare, safety, employment and pleasure of mankind.
4. One who designs and maintains works of public utility is known as civil engineer.

5. Branches of Civil Engineering :

- (1) Surveying and levelling (2) Building, planning and construction
 - (3) Advanced construction (4) Structural Engineering
 - (5) Geotechnical Engineering (6) Water resources Engineering
 - (7) Transportation Engineering (8) Environmental Engineering
 - (9) Town planning
6. The main scope of Civil Engineering or the task of Civil Engineering is planning, designing, estimating, supervising construction, managing construction execution and maintenance of structures like buildings, roads, bridges, dams etc.

7. The scope of Civil Engineering is two fold :

- (1) Scope of civil engineering according to the field of work, area of services and type of the structure are (i) Building construction, (ii) Construction of heavy structures, (iii) Geotechnical engineering, (iv) Transportation engineering, (v) Water resources engineering, (vi) Environmental engineering, (vii) Town planning.
- (2) Scope of civil engineering according to the functions of civil engineering are (i) Surveying, (ii) Planning, (iii) Structural analysis and design, (iv) Professional practice, (v) Construction management, (vi) Quality control and research and (vii) Maintenance of structure.

8. Role of Civil Engineers :

Civil Engineer is the one who designs or maintains works of public utilities. The main roles or duties of civil engineers are :

- (1) In surveying, planning, designing, estimation and execution of structures.
- (2) To use scientific and engineering principles.
- (3) To solve different engineering problems.
- (4) To implement management techniques.
- (5) To carry out surveying and levelling with survey instruments.
- (6) To carry out soil investigations.
- (7) To carry out planning of building.
- (8) To carry out the design of structures.
- (9) To carry out quantity survey and to prepare estimate.
- (10) To invite tenders.
- (11) To supervise the work during execution.
- (12) To carry out valuation of land or building.
- (13) To maintain public health and protect the environment.
- (14) To work for general welfare of people.
- (15) To provide basic infrastructure of the structures for projects of many other engineering disciplines.
- (16) To carry out maintenance work of structures.

9. Impact of infrastructural development :

- The infrastructural sector covers a wide range of services such as (i) transportation, which includes roads, railways, ports, airports, shipping, civil aviation, (ii) Water resources projects, (iii) Power generation, transmission and distribution, (iv) Telecommunication, (v) Postal facilities, (vi) Banking and (vii) Science and Technology.
- Infrastructure is the backbone of nation's progress.
- For economic and industrial development of a nation, infrastructural development is a basic and prime need.
- Well developed infrastructural facilities are the key to development of any nation.
- Per capita income and Gross domestic product are the economic measures for assessment of development.
- Due to the acceleration of progress of infrastructural projects overall development and upliftment of common people can be done.
- In India, due to recent development in infrastructural sections, country has progressed well.
- Thus, the infrastructure development is key to economic development of any country.

*** REVIEW QUESTIONS ***

[1] G.T.U., Winter 2013

Q.2 (a) Explain role of civil engineer in infrastructure development. 07
 [P. 1.11]

[2] G.T.U., Summer 2014

Q.7 (b) (i) Explain the term Infrastructure. [P. 1.13] 04

[3] G.T.U., Winter 2014

Q.2 (a) Discuss the Impact of infrastructural development on the economy of a country. [P. 1.15] 03

[4] G.T.U., Summer 2015

Q.3. (b) Briefly explain the role of Civil Engineer in infrastructure development. 04
 [P. 1.11]

*** EXERCISE ***

1. Enlist and explain different branches of civil engineering.
2. Discuss scope of civil engineering.
3. Explain role of civil engineers.
4. Discuss the impact of infrastructural development on the economy of a country.

*** OBJECTIVE TYPE QUESTIONS ***

1. Civil engineering is that field of engineering concerned with
 - (a) Planning, design and construction of structures
 - (b) Development of natural resources
 - (c) Maintenance and repairing works
 - (d) All above
2. In India, the first engineering college was established in 1847 as first engineering college at
 - (a) Bombay
 - (b) Delhi
 - (c) Roorkee
 - (d) Kanpur
3. Scope of civil engineering according to the field of work is
 - (a) Building construction
 - (b) Water resources engineering
 - (c) Transportation engineering
 - (d) All above
4. Scope of civil engineering according to the functions of civil engineering is
 - (a) Surveying
 - (b) Planning
 - (c) Maintenance of structures
 - (d) All above

Objective Answers

- Answers**

1. (d) 2. (c) 3. (d) 4. (d) 5. (d)
8. (c) 9. (d) 10. (a) 11. (d) 12. (a) 6. (d)
 ♦ ♦ ♦ 13. (d) 7. (a)